animal's 'cephalo thorax' is so remarkable that 'the function of chewing is devolved upon the legs.' We only advise our friends who may be intensely anxious about these points to consult his letter *in extenso.*" Is the author of "What is a Joule?" the special scientific correspondent of all the daily papers?

WE learn from the *Journal of the Society of Arts* that King Victor Emmanuel has presented to the Geological Museum of the University of Rome a collection of Peruvian antiquities—silver vases, curious musical instruments, a coloured garment made from the bark of trees, and arrows and lances. The articles were discovered in a guano bed, and are antiques. The lances are notched, ornamented with feathers, and have wooden heads, showing that they were made before iron was used.

A REPORT of the meeting of delegates of the French departmental learned societies, held on the 4th inst., under the presidency of M. Jules Simon, is given in *Les Mondes*. The following medals were awarded:—Gold: to Grenier, of Besançon, botanical researches; Grandidier, scientific travels in Madagascar; Houzeau, of Rouen, researches in ozone. Silver: to Boussinesq, of Gap, mathematical mechanics; Tourdes, of Strasbourg, legal medicine; Faivre, of Lyons, vegetable physiology; Fromontel, of Gray, palæontology; Reboul, of Besançon, chemistry; Cailletet, of Châtillon-sur-Seine, agricultural and industrial chemistry; Mazure, of Bar-le-Duc, agriculture; Chautard, of Nancy, meteorology; Coquelin, of Beauficel, meteorology; Crova, of Montpellier, physics; Raoult, of Grenoble, physics; Mussy, of Montluçon, a geological map of Ariége.

PROF. HAYDEN has applied to the Congress of the United States for a grant of 75,000 dols. for the purpose of continuing for another year his most important geological survey of the territories of the United States. He proposes making a thorough series of astronomical, topographical, meteorological, geological, and chemical observations, which cannot but be of the utmost value in developing the material resources of the country. The application has the cordial support of the Secretary of the Interior.

SCIENTIFIC INTELLIGENCE FROM AMERICA[*]

MAJOR POWELL has returned from the cañons of the Colorado, having left his party in the field in charge of Prof. Thompson. Since the party started in April last, it has passed through the cañons of Green River and the cañons of the Colorado to the mouth of the Paria, at the head of Marble Cañon. Here the Major left his boats for the winter, and he expects to return as soon as there is a favourable stage of water, and embark for the second trip through the Grand Cañon. On the way down the party explored the region to the west of the Green and Colorado, tracing the courses of the larger streams emptying into the two great rivers to their sources in the Wasatch Mountains and Sevier Plateau, and examined the geology of the great mesas and cliffs. Early in the winter a base-line 47,000 feet in length was measured on a meridian running south from Kanab, and the party is now engaged in extending a system of triangles along the cliffs and peaks among lateral cañons of the Colorado. During the past season the party has discovered many more ruins of the communal houses once occupied by the prehistoric people of that land. Many of these houses stood upon the cliffs overhanging the cañons, and many more are found in the valleys among the mountains to the west. Stone implements, pottery, basket-ware, and other articles were found buried in some of the ruins. The Major found a tribe of Utes on the Kaibab Plateau who still make stone arrow-heads and other stone implements, and he had an opportunity to observe the process of manufacturing such tools.—Mr. Joseph Sullivant, of Columbus, Ohio, a well-known naturalist, publishes an account in the *Ohio State Journal* of the capture of the *Bassaris astuta*, or ring-tailed cat of the Rio Grande region. It was taken in Fairfield County, Ohio, and was said to be accompanied by a second specimen. The occurrence of this animal so far north is very remarkable, and it may be a question whether it had not been brought from Mexico or California, and escaped from confinement. It is an animal very much sought after as a pet, being clean in its habits, and readily becoming very tame and affectionate; indeed, it would seem to be quite a desirable animal to domesticate and keep about the house as a protection against rats and mice. Some years ago a specimen of this same animal was brought into the Smithsonian Institution, having been captured in a hen-coop near the city. It was in capital condition and in full fur; but it had evidently escaped from captivity, as shown by the marks of the rubbing of a collar round the neck.—The greatest depth between the west end of Cuba and the coast of Yucatan found by the Coast Survey steamer *Bibb* is 1,164 fathoms, as reported to Prof. Peirce by Captain Robert Platt, commanding the surveying vessel. The lowest temperature observed is 39·5° F. at the bottom; surface, 81°; strongest current, two knots; direction, north. Dr. Stimpson reports the bottom from Cape San Antonio to Yucatan very barren of animal life. A few rare shells were found.—In a paper by Prof. Cope upon the *Pythonomorpha*, or Python-like fossil saurians of the cretaceous formation of Kansas, presented to the Academy of the American Philosophical Society of Philadelphia, he shows that America is the home of this group, four species only having been described from Europe. Forty-two North American species are already known, of which fifteen belong to the Greensand formation of New Jersey, seven to the Limestone region of Alabama, seventeen to the Chalk of Kansas, and three to other localities. Of the Kansas species six are described as new by Prof. Cope in the paper referred to.—A new fossil reptile, from the cretaceous strata of Kansas, has just been described by Prof Cope under the name of *Cynocercus incisus*. The peculiarity of this reptile consists in having the articular faces of the vertebræ deeply excavated above and below, so as to give them a transverse character. A new crocodilian from the same region was also described, under the name of *Hyposaurus webbii*.—Prof. Cope has shown, in a paper read to the American Philosophical Society, that the greater number of the fossil fishes of the cretaceous strata of Kansas belong to three families, namely, the *Saurodontidæ*, the *Pachyrhizodontidæ*, and the *Stratodontidæ*. Of the first family four genera and ten species are described in his paper, some of them (as those of the genus *Portheus*) being among the most formidable of marine fishes. Of the second family one genus and four species are introduced, and three genera and seven species of the third. The *Stratodus*, a genus of the *Stratodontidæ*, is provided with multitudes of minute shovel-headed teeth. He finds a great resemblance between this Kansas fauna and that of the English Chalk, no less than six of the eight Kansas genera having been found in the latter.—Some of our readers may remember the letter written by Prof. Agassiz to Prof. Peirce in December 1871, just before starting upon the Hassler expedition, in which he announced beforehand the general nature of the discoveries that he expected to make. His ability to make these predictions with any degree of certainty was much questioned by those who were not familiar with the method of research in natural history, and of the almost mathematical nature of the inferences to be derived from certain given premises. We now have a second letter addressed to Prof. Peirce, written at Pernambuco on Jan. 16, giving an account of experiences up to that date, which go far toward showing that the Professor really knew of what he was speaking in the first instance. Owing to various adverse influences, among them the necessity of hastening with all possible despatch to reach the Straits of Magellan at the earliest possible date, only four hauls of the dredge were made in water of any great depth, those being at depths of from 75 to 120 fathoms off Barbadoes. The results of these were in the highest degree satisfactory, however, "the extent and variety of material obtained being enough to occupy," in the Professor's words, "half a dozen competent zoologists for a whole year, if the specimens could be kept fresh for that length of time." As anticipated by the Professor in the letter referred to, the most interesting discoveries were certain forms of animals, the allies of which had previously been known in greater part or entirely as fossils of older formations. Among these may be mentioned a remarkable sponge, a crinoid very much like *Rhizocrinus*, a living *Pleurotomaria*, only three having been previously known, although a great many are described as fossil, &c. The crinoid, especially, is one of the very few living representatives of what was originally the prevailing character of

---

[*] Communicated by the Scientific Editor of *Harper's Weekly*.

©1872 Nature Publishing Group

the marine fauna of the silurian and other epochs; and while now they occur only in the very deepest water, they were formerly found crowded in the shallower seas. The inquiry, therefore, suggested itself to the Professor as to the reason of this difference, and he makes the suggestion that in the progress of the earth's growth we may look to such displacement of conditions favourable to maintaining certain low types as may recall most fully the adaptation to former ages, and that the deeper waters of the present constitution of our globe possibly approximate the conditions of animal life in the shallow seas of former ages as nearly as anything can in the present order of things on the earth. The depth of the ocean alone, he thinks, can place animals under the high pressure which the heavier atmosphere of the earlier period afforded. But as such pressure cannot be a favourable condition for the development of life, it is to be expected that the lower forms only will occur in the deep seas. Other causes acting in the same direction are the decrease of light in the greater depths, the smaller amount of free oxygen, the reduced amount and smaller variety of nutritive substances, &c. He does not think, however, that facts warrant the conclusion that any of the animals now living are lineal descendants of those of the earlier ages, nor that we may justly assume that the cretaceons formation is still extant, notwithstanding the similarity of forms. It would be just as true to nature to say that the tertiary period is exhibited in the tropics, on account of the similarity of the Miocene mammalia and those of the torrid zone.—The ninth number of the illustrated work on the butterflies of North America, in course of publication by Mr. William H. Edwards, has just made its appearance, and we are informed that the tenth number, to appear very shortly, will conclude the first volume. This number, like its predecessors, is accompanied by a great many quarto plates in the highest style of pictorial excellence, depicting some extremely beautiful species and varieties of butterflies. Among these are three varieties of *Papilio Ajax*, namely, *Walshii*, *telamonides*, and *Marcellus*. Mr. Edwards, in his paper, makes some judicious remarks upon the uncertainty that exists in regard to the true character of many butterflies which some naturalists consider as perfectly distinct species, and others as mere varieties. He takes the ground that the only way of coming to a satisfactory conclusion is to breed them, and ascertain whether the eggs from the same female develop similar larvæ or not, and whether these, even if different, produce the same perfect insects or different ones. The attempt at discriminating from the perfect insect alone he considers extremely unsatisfactory.

ANNUAL ADDRESS TO THE GEOLOGICAL SOCIETY OF LONDON, FEB. 16, 1872

BY J. PRESTWICH, F.R.S., PRESIDENT

(*Concluded from p.* 472.)

IT has been urged as a fatal objection to the discovery of coal in the south-east of England, that the Coal Measures become unproductive and thin out under the Chalk, as they range from Valenciennes towards Calais, and, therefore, that the coal-trough or basins end there. It is perfectly true that the Coal Measures do thin out between Bethune and Calais, but not in the sense of their dying out owing to their deposition near the edge of a basin. In that case, each seam, each stratum, would gradually become thinner and disappear; but such is not the fact. None of the beds of the Belgian coal-field are thick. The average does not exceed 2¼ feet. At Valenciennes it is the same; whereas M. Burat states the mean thickness of the beds actually increases westward of Bethune to more than 2½ feet. With respect also to the extreme end of this basin, the lower beds there brought up correspond with the bottom beds of the Hainault basin, where the lower 650 feet consist of unproductive measures. The thinning-out is, in fact, due to denudation, just as the Bristol coal-field thins out at Cromhall to resume in the Forest of Dean, or the coal-field of Liége thins out at Nameche to resume at Namur in the great field of Charleroi and Mons.

The deterioration of the coal in the small coal-field of Hardinghen, near Boulogne, has also been adduced against the occurrence of workable coal in South-Eastern England, but Mr. Godwin-Austen has shown that this Hardinghen coal-field is one of those small local developments of coal-bearing strata intercalated in the Mountain Limestone, and is of older date than the great Belgian coal-field. It has, therefore, no bearing on this part of the question.

Another objection to which much weight has been attached is that the coal-field of Bath and Bristol forms an independent basin, cut off both on the east and on the west by ridges of Millstone Grit and Mountain Limestone, so that there is an end of the eastern extension of the Coal Measures. This is quite correct as far as regards the western edge, and is probably the case on the eastern, although as the edge of the basin is there covered by Secondary rocks, some uncertainty still exists about the disposition of the Palæozoic rocks under them. Admitting, however, the basin to be complete and isolated, that is no proof that the older Palæozoic rocks prevail exclusively to the east; for the Coal Measures of the Somerset basin maintain their full development to the edge of the basin, and are there cut off by denudation, and are not brought to an end by thinning out. They form really part of a more extended mass, of which we have there one fragment; while on the west another portion exists in the Welsh basin, and another in the newly discovered small basin of the Severn valley.

This last basin is entirely covered by the New Red Sandstone; and as the Welsh basin is bounded on the east and the Bristol basin on the west by Mountain Limestone, the same argument as the one above might have been used to show the impossibility of coal occurring in this intermediate area.

But the fact is, it is the very nature of this great line of disturbance to have minor rolls and flexures of the strata at, or nearly at, right angles to it, and so causing breaks in the coal-trough, which would otherwise flank it without interruption; thus the Aix-la-Chapelle coal-field is separated by older rocks from that of Liége, which is again separated by a ridge of Mountain Limestone from that of Hainaut. So in the case of south-western England, we have the several basins of South Wales, Severn Valley, and Bristol, separated by tracts of Mountain Limestone and Old Red Sandstone, the extremes of the intervening belts of older rocks being two miles at Nameche and eighteen miles in Wales. These barriers are clearly only local, and the division of the Coal Measures into separate basins appears to be their ordinary condition along this great line of disturbance. The length of the two known portions of the axis included between Pembrokeshire and Frome, and between Calais and Westphalia, is 472 miles, and in this distance we find eight separate and distinct coal-fields. The combined length of these eight coal-fields is about 350 miles, leaving about 122 miles occupied by intervening tracts of older rocks; so that nearly three-quarters of the whole length is occupied by coal-strata. I consider that a structure which is constant (so far as the axis of disturbance can be traced above ground) is, in all probability, continued under ground in connection with the range of the same line of disturbance; and I see no reason why the coal-strata should not occupy as great a proportionate length and breadth in the under-ground and unknown, as in the above-ground and explored area.

With respect to the possibility of denudation having removed the intervening Coal Measures, enormous as the extent of denudation must have been previous to the deposition of the Permian strata, we cannot admit its exceptional action in this case. Denudation has removed from the crest of the Mendips a mass of strata possibly equal to two miles or more in height, and from that of the Ardennes as much as three or four miles, and it has also worn extensive channels between many of our coal-fields, so that the power of such an agent cannot be denied. But it is a power of planing down exposed surfaces rather than of excavating very deep troughs. Notwithstanding its immense planing-down action on the Mendips and Ardennes, deep troughs of Coal Measures are left flanking their northern slopes. These troughs descend to more than a mile beneath the level of the sea; and I do not think it probable that those underground intermediate portions of the trough where the axis is lower, would have suffered more than those on the higher levels, unless it were to the extent caused by the later denudation which preceded the Cretaceous period. But this would not affect the main bulk of the Coal Measures. The Belgian coal-field, which was exposed to the action of both these denudations, still retains vast proportions.

I may remark that the pre-Cretaceous denudation was very irregular in its action. At one place near Mons the Chalk and Tertiary strata are above 900 feet thick; whilst at another, on about the same level, and at but a short distance, they are not 100 feet thick—an old under-ground hill of highly inclined

©1872 Nature Publishing Group